AUDIT ASSURANCE

Comprehensive Guide to Audit Sampling for Tests of Controls and Substantive Tests of Transactions

Published: January 28, 2025 | Index ID: #256

In the complex landscape of modern financial auditing, the ability to draw accurate conclusions about massive datasets without examining every single transaction is not just a convenience—it is a necessity. **Audit sampling** serves as the backbone of this efficiency. As detailed in the seminal work of Arens, Elder, and Beasley, specifically within **Chapter 15 of Auditing and Assurance Services**, audit sampling allows practitioners to provide a high level of assurance while managing resource constraints. This article provides an exhaustive technical analysis of audit sampling for tests of controls and substantive tests of transactions, exploring the methodology, mathematical foundations, and practical application of these critical audit procedures.

The Theoretical Foundation of Audit Sampling

Audit sampling is defined as the application of audit procedures to less than 100 percent of the items within an account balance or class of transactions such that all sampling units have a chance of selection. The primary objective is to provide the auditor with a reasonable basis on which to draw conclusions about the entire population. In the context of **tests of controls** and **substantive tests of transactions**, the auditor is looking for the presence or absence of specific attributes (internal control compliance) or the occurrence of monetary misstatements.

Representative Samples and Sampling Risk

A **representative sample**is one in which the characteristics in the sample are approximately the same as those of the population. In practice, auditors can never be certain that a sample is perfectly representative. This uncertainty gives rise to two distinct types of risk:

- Sampling Risk: The risk that the auditor reaches an incorrect conclusion because the sample is not representative of the population. This can lead to two errors: the risk of overreliance (assessing control risk too low) and the risk of underreliance (assessing control risk too high).
- Non-Sampling Risk: The risk that the audit tests do not uncover existing exceptions in the sample. This occurs due to human error, such as the auditor failing to recognize an exception or applying inappropriate audit procedures.

Statistical vs. Non-Statistical Sampling

Modern auditing frameworks allow for both statistical and non-statistical sampling. While both require professional judgment, they differ in how risk is quantified. **Statistical sampling** applies mathematical rules to measure sampling risk, allowing the auditor to state the results at a specific confidence level. **Non-statistical sampling**, often referred to as judgmental sampling, does not quantify sampling risk but relies on the auditor's expertise to select items most likely to contain misstatements.

Technical Framework: The 14-Step Process of Audit Sampling

Chapter 15 of the Arens text outlines a rigorous 14-step procedure for applying audit sampling to tests of controls and substantive tests of transactions. These steps are categorized into three main phases: Planning the Sample, Selecting the Sample and Performing the Audit Procedures, and Evaluating the Results.

Phase I: Planning the Sample

1. State the objectives of the audit test: Usually, the objective is to test the effectiveness of specific internal controls or the monetary accuracy of transactions.
2. Decide whether audit sampling applies: Sampling is used when there is a documented trail (e.g., invoices, shipping documents) but may not apply to automated controls that leave no physical evidence.
3. Define attributes and exception conditions: An attribute is the characteristic being tested (e.g., "Is the invoice signed?"). An exception occurs when the attribute is missing.
4. Define the population: The auditor must ensure the population is complete and appropriate for the audit objective.
5. Define the sampling unit: This is the individual item in the population (e.g., a sales invoice or a line item).
6. Specify the Tolerable Exception Rate (TER): This is the highest exception rate the auditor will permit in the population and still be willing to conclude the control is operating effectively.
7. Specify Acceptable Risk of Overreliance (ARO): This measures the risk the auditor is willing to take of accepting a control as effective when the true population exception rate is greater than TER.
8. Estimate the Population Exception Rate (EPER): Based on prior year results or a pilot sample, the auditor predicts the exception rate before testing begins.
9. Determine the initial sample size: This is calculated based on TER, ARO, and EPER.

Phase II: Selecting the Sample and Performing Procedures

1. Select the sample: Common methods include random number selection, systematic selection, or haphazard selection.
2. Perform the audit procedures: The auditor examines the selected items and identifies any exceptions.

Phase III: Evaluating the Results

1. Generalize from the sample to the population: The auditor calculates the Sample Exception Rate (SER) and the Computed Upper Exception Rate (CUER).
2. Analyze the exceptions: The auditor must investigate the nature and cause of each exception (e.g., was it an intentional fraud or a simple misunderstanding?).
3. Decide the acceptability of the population: If CUER ≤ TER, the population is accepted as reliable.

Mathematical Models and Parameter Relationships

Understanding the mathematical relationship between sampling parameters is essential for effective audit design. The following table summarizes how changes in input factors affect the required sample size.

Factor	Change in Factor	Effect on Sample Size	Logic/Technical Reason
Acceptable Risk of Overreliance (ARO)	Increase	Decrease	The auditor is willing to accept more risk, requiring less evidence.
Tolerable Exception Rate (TER)	Increase	Decrease	A higher tolerance for error allows for a smaller sample.
Estimated Population Exception Rate (EPER)	Increase	Increase	If more errors are expected, a larger sample is needed to find them accurately.
Population Size	Increase	Minor Increase / No Change	In large populations, the size of the population has negligible impact on sample size.

Calculating the Computed Upper Exception Rate (CUER)

In statistical sampling, the **CUER** is the upper limit of the interval estimate. It is calculated as:

CUER = SER + Allowance for Sampling Risk

Where **SER (Sample Exception Rate)**= Number of exceptions / Sample size. If the CUER exceeds the TER, the auditor must conclude that the control is not operating effectively at the desired level of confidence. In such cases, the auditor may increase substantive testing or request that the client correct the underlying control weakness.

Sampling Methodologies: A Comparative Analysis

Auditors have several choices when selecting items for testing. The selection method must align with whether the auditor is using statistical or non-statistical evaluation.

1. Probabilistic Selection (Statistical)

- Simple Random Sample: Every possible combination of population items has an equal chance of being included. Usually performed using Generalized Audit Software (GAS).
- Systematic Sample Selection: The auditor calculates an interval (Population Size / Sample Size) and selects items based on that interval from a random starting point.
- Probability Proportional to Size (PPS): Selecting items where the probability of selection is proportional to their recorded dollar amounts. This is highly effective for substantive tests of transactions.

2. Non-Probabilistic Selection (Non-Statistical)

- Haphazard Selection: Selection of items without any conscious bias by the auditor. While intended to be random, it is susceptible to human bias.
- Block Sample Selection: Selecting several items in a sequence (e.g., all sales for the third week of March). This is generally discouraged unless the auditor tests a sufficient number of blocks.

Comparison Matrix of Sampling Types

Feature	Attribute Sampling	Variable Sampling	Discovery Sampling
Primary Use	Tests of Controls	Substantive Tests (Balances)	Fraud Detection
Measurement	Error Frequency (Rate)	Monetary Amounts ($)	Occurrence of a single event
Statistical Basis	Binomial Distribution	Normal Distribution	Probabilistic

Field Guide: Implementing Attribute Sampling in a Sales Cycle

To illustrate the practical application of **Chapter 15 concepts**, consider an audit of a company's sales cycle. The objective is to determine if sales are supported by valid shipping documents (Existence/Occurrence objective).

Step 1: Planning

The auditor sets the **TER at 5%** and the **ARO at 10%**. Based on last year's audit, the **EPER is 1%**. Using an attribute sampling table, the auditor determines a required **sample size of 77 items**.

Step 2: Execution

The auditor uses a random number generator to select 77 sales invoices from the sales journal. For each invoice, the auditor looks for the corresponding bill of lading. During the test, the auditor finds 2 invoices that lack shipping documentation.

Step 3: Evaluation

- SER: 2 / 77 = 2.6%
- CUER: Consulting a statistical table for a sample of 77 with 2 exceptions at a 10% ARO, the CUER is found to be 6.8%.
- Decision: Since the CUER (6.8%) > TER (5%), the auditor concludes that the control is not operating effectively. The auditor must now expand substantive testing of sales transactions to ensure that no material misstatements exist in the financial statements.

Troubleshooting Common Sampling Failures

Even with advanced statistical tools, sampling can fail due to procedural errors or misinterpretations. Here are common challenges and their technical solutions:

1. Failure to Properly Define Exceptions

Problem: The auditor identifies a document that is missing a signature but ignores it because the transaction "looks correct."

Solution: Strict adherence to the 14-step framework. If a control specifies a signature is required, its absence MUST be recorded as an exception, regardless of the transaction's monetary accuracy.

2. Improper Population Definition

Problem: Auditing the sales journal but failing to realize the journal is missing the last three days of the year.

Solution: Perform **footing and cross-footing**and reconcile the population to the general ledger before selecting the sample.

3. Over-reliance on Haphazard Sampling

Problem: Auditors naturally gravitate toward selecting items that look "easy to test," leading to a biased sample.

Solution: Transition to computer-assisted audit techniques (CAATs) for random selection to eliminate human bias.

Broader Implications for Audit Quality and Automation

The methodologies discussed in Chapter 15 provide a foundation for audit quality, but the profession is moving toward **continuous auditing** and **data analytics**. While traditional sampling assumes we cannot test 100% of the data, modern AI-driven tools can now analyze entire populations for certain types of tests.

However, sampling remains vital for tests that require physical inspection or qualitative judgment—areas where AI still struggles. For instance, verifying that a piece of equipment exists or that a complex contract was properly interpreted still requires the auditor to select a sample and perform "on-the-ground" procedures. The integration of **statistical sampling theory** with **Big Data analytics**represents the next frontier of assurance services. By understanding the rigorous mathematical underpinnings of sampling risk and exception rates, auditors can better design hybrid approaches that combine the speed of automation with the precision of statistical inference.

Ultimately, the goal of audit sampling is to provide a defensible, objective basis for the audit opinion. Whether using Arens' 14 steps or advanced algorithmic selection, the core principles remain the same: define the risk, determine the tolerance, select without bias, and evaluate with professional skepticism. As regulatory environments become more demanding, the mastery of these sampling techniques is not just an academic exercise but a critical component of a senior auditor’s technical toolkit.

Baca Juga (Artikel Terkait)